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ENHANCEMENT OF RESEARCH ENVIRONMENT

FINAL REPORT

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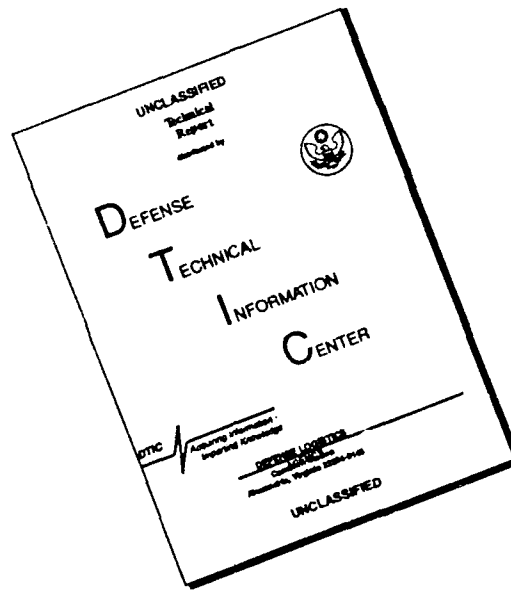
TUSKEGEE UNIVERSITY

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## GOAL

The overall goal of this project was to improve the capability of Tuskegee University to successfully compete for and complete Department of Defense research contracts and grants. This was accomplished by making strategic enhancements to the existing academic and research environment on campus. The result was an expanded ability to perform research related to national defense, as well as improved preparation for graduates to function effectively in the highly technical environments they will enter.

## OBJECTIVES

The objectives proposed for this project were as follows:

1. Tuskegee University proposed to establish an Interdisciplinary Instrumentation Laboratory in the new Chappie James Center to support accredited engineering programs; Mechanical, Electrical, and Chemical. The laboratory focuses on sensors, data analysis equipment, digital signal processing, digital controls, and other instrumentation which has evolved from recent technological advances. This laboratory enhances the hands-on capabilities of the School of Engineering and Architecture, thereby providing students with a more research-oriented engineering education. The interdisciplinary aspect of this laboratory provides opportunities early in a student's education for cross-fertilization of concepts with practitioners of related disciplines.
2. Tuskegee University proposed to further expand the capabilities of the installed Digital Equipment Corporation VAX computers by the addition of memory, disk storage, terminals, and high-speed networking capability.
3. Tuskegee University proposed to sponsor a summer Ada language seminar for college faculty from the consortium member schools, other Historically Black Colleges and Universities, and other institutions. This seminar was designed to provide the cultural assimilation necessary to the proper use and teaching of Ada along with high-quality language instruction. It consisted of a carefully-designed mix of lecture and laboratory work compressed into four intensive weeks of full-time effort. It provided participants with knowledge of all the major features of the language, as well as enough experience to enable them to see firsthand the types of problems the language was designed to solve. They were prepared not only to instruct students in the proper use of the language, but to impress upon them the importance of the related problem-solving and analysis techniques. This type of seminar is believed unique, and is the best way to develop faculty to support the diffusion of the language throughout academia.

4. Tuskegee University proposed to contract with Systems and Computer Technology, Inc., a firm of highly specialized consultants, to assist with strategic and tactical planning for the best utilization and management of campus telecommunications facilities.

#### RESULTS OF THE PROJECT:

##### 1. Interdisciplinary Instrumentation Laboratory

Three major categories of equipment were acquired for the interdisciplinary instrumentation laboratory. The major installation was a fully-instrumented computer-controlled gas turbine engine. This unit supports research in a multitude of different fields, including theory of propulsion, sensors and data acquisition, real-time computer controls, and fuels technology. Only two other engineering schools in the country possess computer-controlled turbine engines of this level of sophistication. A research plan has been developed which includes emphasis on alternate fuels such as alcohols produced from "waste feed stock" such as potato skins, corn husks and stalks. A laboratory plan has been developed for implementation of the unit into the propulsion course in the Aerospace Science curriculum (AE 346L).

Another major feature of the laboratory is a group of five PC instruments, which have been installed and are in use. These instruments are personal computers containing the necessary hardware and software configuration to function as complete laboratory test consoles. The same unit may function as an oscilloscope, a spectrum analyzer, or other complex test equipment, either at different times or in a time-shared mode. Five of these systems can completely equip a laboratory for a wide variety of research functions. These instruments have substantially increased the capabilities of the students to perform complex measurements such as multi-port analysis of sensors and sensor controls. Faculty are also using these instruments for research.

The third major feature of the interdisciplinary instrumentation laboratory project was the installation of 40 VT320 terminals and a serial line printer. These devices, connected by communications to the central computer center, dramatically improved student access to computing resources for instruction and research.

## 2. Vax Upgrade

This project resulted in the installation of 8 Mbytes of main memory in the primary student and faculty research machine, the VAX-11/780. This installation was completed in time to support the Ada Seminar. The positive effect on the ability of the VAX to accommodate large numbers of heavy resource-consuming users was immediately apparent. The optimum configuration for this machine has now been reached. Also installed were the necessary hardware interfaces and controllers to connect all five of our VAX machines into one Ethernet. The Ethernet has been no less valuable, enabling user access to multiple machines and file transfers almost as if they were one.

The reprogramming of the Telecommunications Study funds, outlined below, enabled the use of these funds as matching for a major grant from Digital Equipment Corporation, which resulted in installation of a fully-configured VAX 6320 system and several modern workstations. This project will enable consolidation of the functions presently being accomplished on three VAX 70 series machines onto one new system, releasing the older systems for other uses better suited to their capacity. This project, which would not have been possible without the Army funds, will more than triple the computing power available to faculty and students. Additionally, it forms the foundation for a major partnership effort with Digital which will further enhance the University's academic computing facilities over a period of several years.

## 3. Ada Faculty Seminar

A highly successful Ada Faculty Seminar was held June 5-July 1, 1988, with 15 participants from as many institutions. Faculty and participants alike had high praise for the quality of the learning experience and the value of the seminar in facilitating expansion of Ada teaching expertise into more schools. A paper discussing the experiences gained from the seminar was presented at the National Conference on Ada Technology in March 1989. Exploratory efforts are under way to determine a source of continuing funding for these important seminars.

## 4. Telecommunications Study

As a result of events and opportunities which arose during the grant period, a determination was made that an expansion of the VAX Upgrade project should receive a higher priority than the Telecommunications Study. Therefore, a request was made and approval granted to reprogram the funds allocated for the Telecommunications Study to the VAX Upgrade project.

#### PUBLICATIONS RESULTING FROM THE GRANT

Paper: Ada Summer Seminar: Teaching the Teachers; Dr. M. Susan Richman, Dr. Charles Petersen, Donald C. Fuhr. Presented at the Seventh National Conference on Ada Technology; Atlantic City, NJ, March 14-16, 1989.

#### SUMMARY OF GRANT IMPACTS TO DATE

This grant has resulted in a significant enhancement to the University's research facilities, well beyond that envisioned at the time the proposal was written. In fact, Tuskegee undergraduate and graduate students are now able to perform research using equipment of a quality and versatility found in very few institutions. There can be no doubt of the positive effect of this environment on their future careers.

Of even greater importance, however, is the leverage this grant has provided to begin the long-term partnership with Digital Equipment Corporation. Through this mechanism, the funds provided will be multiplied many times over, enabling the building of the campus-wide network to the level required to support Tuskegee University's computing efforts into the next century.